

Ceramic Heat Exchangers and Chemical Reactors with Micro-Scale Features for In-Situ Resource Processing, Phase I

Completed Technology Project (2005 - 2005)



Project Introduction

It is proposed to develop compact and lightweight ceramic heat exchangers and chemical reactors suitable for high temperature processes. These devices will have micro-scale geometric features that would result in very high heat and mass transfer rates per unit volume and per unit frontal area. The process for fabrication of these devices is based on a novel micro-machining and joining technique that promises to deliver ceramics components that can survive temperatures in excess of 1000 oC, and moderate to high pressures. As ceramics are the natural host for a large number of catalysts, the proposed devices would allow fabrication of extremely compact chemical reactors capable of operating at high temperatures. These devices can be used to thermally couple exothermic and endothermic reactions. Furthermore, temperature-sensitive reactive streams can be coupled to heat transfer streams to achieve temperature-controlled chemical reactions at high catalytic conversion and selectivity. Examples would include integrated catalytic combustor and heat exchanger, coupled catalytic combustion and steam reforming, and coupled Sabatier and Reverse Water Gas Shift reactions.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Mezzo Technologies	Supporting Organization	Industry	Baton Rouge, Louisiana

Primary U.S. Work Locations	
Louisiana	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Andrew Mccandless

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes